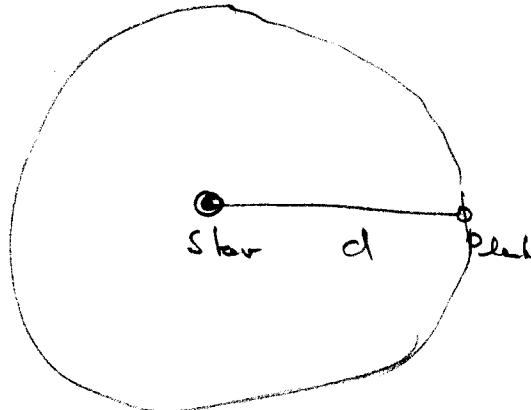


Problem 2

$$\dot{J}_B = \sigma_B T^4 = \frac{\Delta E}{\Delta P \Delta t}$$

2 points



$$\frac{\Delta E}{\Delta t} = \sigma_B T_s^4 4\pi R_s^2$$

⇒ flux at distance d

$$\dot{J}_H(d) = \frac{\sigma_B T_s^4 4\pi R_s^2}{4\pi d^2} = \frac{\sigma_B T_s^4 R_s^2}{d^2}$$

(5 points)

Energy balance at planet:

absorbed: $\dot{J}_H(d) \cdot \pi R_p^2 = \frac{\sigma_B T_s^4 R_s^2}{d^2} \pi R_p^2$ (4 points)

Energy emitted:

$$\sigma_B T_p^4 4\pi R_p^2$$
 (4 points)

absorbed = emitted

$$\frac{T_s^4 R_s^2 \pi R_p^2}{d^2} = T_p^4 4\pi R_p^2$$
 (5 points)